

TECHNICAL CONTRIBUTIONS TO THE UNITED STATES ECONOMY AND  
DEFENSE AS A RESULT OF PHILIPS RESEARCH AND DEVELOPMENT.

I

LAMPS

1 - Sodium lamps (prewar)

2 - High pressure mercury vapor lamps (prewar)

1 and 2 licensed to the International  
General Electric Company, who sub-  
licensed Westinghouse, Sylvania, etc.

3 - Photoflash lamps (prewar)

Aluminum magnesium wire blown in bulb  
instead of aluminum foil

Licensed Wabash Photo Lamp Corporation

II

RADIO TUBES AND WAVE GENERATORS

1 - Indirectly heated cathode (prewar)

2 - Pentode (prewar)

3 - All glass construction (Sylvania  
developed a similar construction  
simultaneously during the war, but  
completely independent)

Licensed to RCA with non-exclusive  
right of sub-licensing by RCA.

4 - Electron multipliers or secondary emission (prewar)  
tubes. The VR90 and 91 Mullard tubes,  
originating from Philips Eindhoven were  
made in this country as EF50 and EF51,  
mainly by Sylvania by the millions during  
the war. Prewar Philips development made  
available through the British Government.

5 - Magnetrons - Preliminary theoretical work by Posthums

APPENDIX A

IIIRADIO APPARATUS

- 1 - Various circuits  
Prewar circuits licensed to RCA. See II-1,2,3
- 2 - Printed wiring (early steps) - see book by (prewar)  
Brunetti, Bureau of Standards
- 3\*- Clickknob (postwar)
- 4\*- Unicrystal tuning (postwar)

IVTRANSMITTING TUBES AND SPECIAL TUBES

- 1 - Air cooled transmitting tubes (prewar)
- 2 - Cathode ray tubes (prewar)
  - a - Early manufacture of cathode ray tubes while RCA was the sole manufacturer in this country. Exports to the United States in 1937, 1938 and 1939.
  - b - Manufactured in United States since inception of war. (war and postwar)

VGLASS METAL JOINT TECHNIQUE

- 1 - Chrome iron glass joints (pre-war but still in use). (Licensed to RCA 16 inch tube) (prewar)
- 2 - Post-war powder glass technique (postwar)  
Developed independently on similar lines by Corning.

VIMATERIALS

- 1 - Permanent magnet steels Alnico V (prewar)  
Made available through licenses with the right to sub-license to General Electric Company and license to Indiana Steel Products Company.

## APPENDIX A

- 2 - Magnetic filters (mainly used in England)
- 3 - Non-conducting magnetic ferrites (Ferroxcube). (postwar)  
Manufactured by North American Philips in  
United States.

## VII

### GENERAL RADIATION RESEARCH (See 11-4)

- 1 - Basic theory for FM and pulse radiation -  
van der Pol et al.
- 2 - Early British development in radar -  
van der Pol et al.  
Made available through scientific publica-  
tions and through the British Government.

## VIII

### X-RAY

- 1 - Rotating anode developments (prewar)  
Made available through licensing of  
Machlett Laboratories, Inc., Westing-  
house, General Electric Company, Eureka  
X-ray Corporation, Amperex Electronic  
Corporation.  
Made by Amperex Electronic Corporation
- 2 - X-ray Diffraction (war and  
postwar)  
Made by North American Philips Company
- 3 - Geiger-Counters (prewar,  
war and  
postwar)  
Standardization and design by Amperex  
and Philips.

## IX

### CRYSTALS

- 1 - Machinery for the manufacture of crystals (war)
- 2 - Research on detwinning of crystals (postwar)

## APPENDIX A

XWIRE

- 1 - Diamond dies (prewar,  
war and  
postwar)
- 2 - Superfine wire
- 3 - Gold clad molybdenum wire (process of  
making gold clad molybdenum wire for  
suppression of secondary electron emis-  
sion) (war and  
postwar)

Made by North American Philips Company

XIZIRCONIUM

- 1 - Getters. Licensed through RCA (prewar)
- 2 - Ductile zirconium (prewar)  
Formerly licensed to Foote Minerals,  
patents expired.

XII

- 1 - Projection system (postwar)

Made by North American Philips Company

XIIIVITAMINS

- 1 - Vitamin D3 - Mussels process made available (prewar)  
by license agreement with du Pont.
- 2a- Vitamin D3 - Bromination process (postwar)

XIVATOMIC RESEARCH

- 1 - Building of high voltage electrostatic genera-  
tors.
- 2 - Isotope manufacture by Betatron and sale.
- 3 - Neutron production - Fermi patents.

XV

ELECTRON MICROSCOPE

Philips Holland sole producer of electron microscopes and electron micro-cameras besides RCA, and other developments and licenses of less importance in special fields such as ceramic condensers, etc.

\*Licenses to manufacture these devices in the United States are available from Philips Laboratories, Inc. to interested firms.

APPENDIX A